CSC Pi-Innovo OpenECU

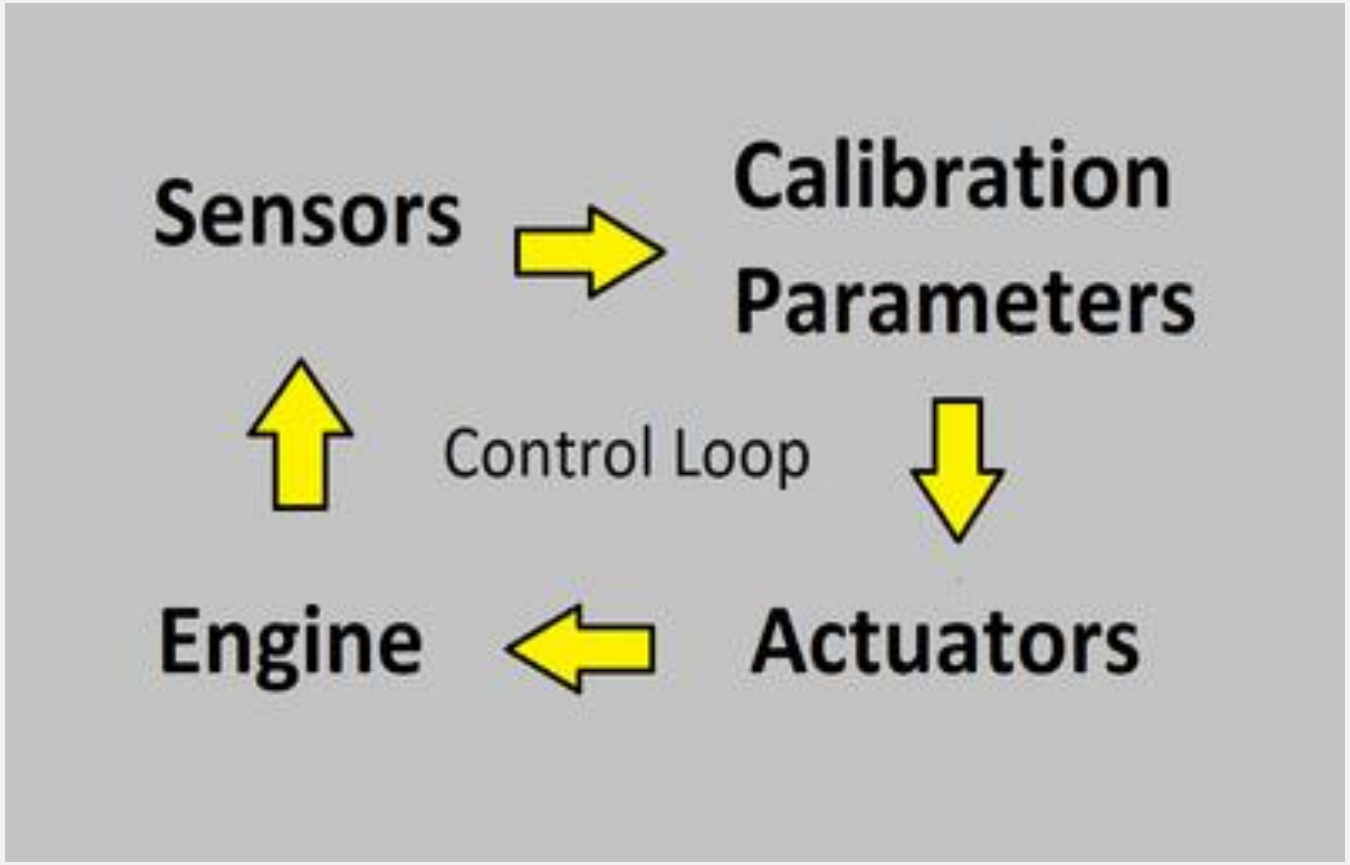
TEAM MEMBERS: Alex Kiss, Colin Parke, Zac Avelar and Hayden Hulse
CLIENT: UICSC – Daniel Cordon

Value Proposition

- Replicate and expand existing ECU functionality
- Allow space for extra sensors and systems
- Allow more advanced control
- Physical wiring + Simulink

Objective

- Develop connectivity between sensor inputs and control systems
- Evaluate engine control unit (ECU) functionality
- Develop useful documentation



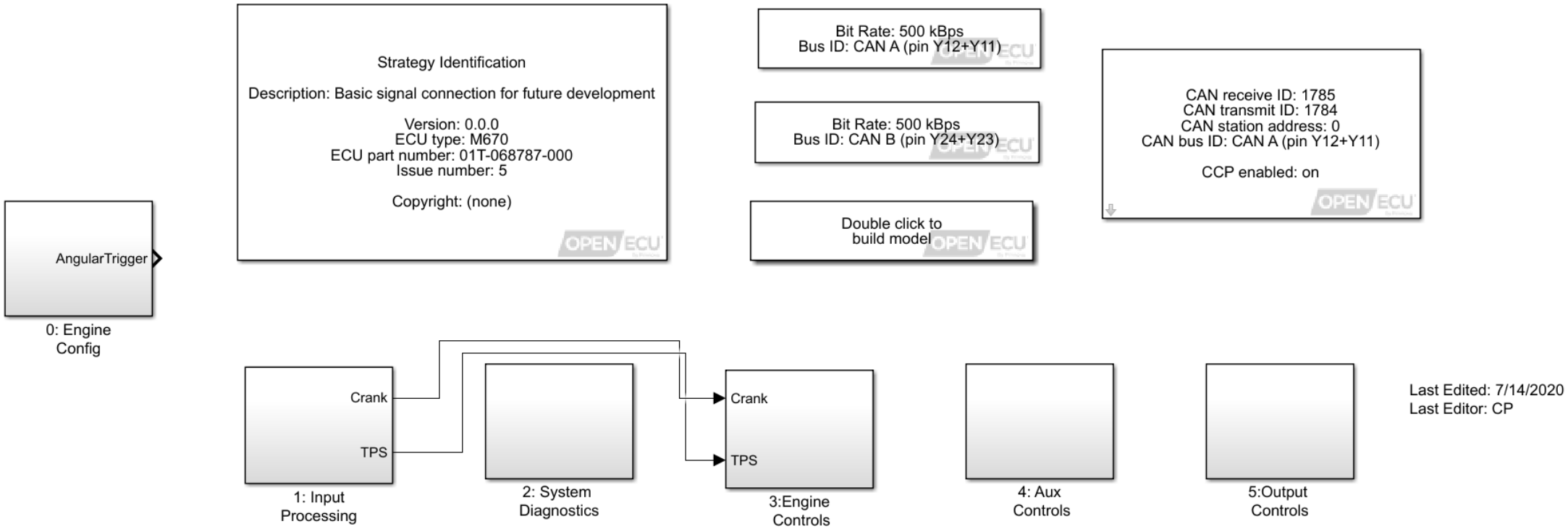
Basic Signal Flow Diagram

Product Requirements

- Intuitive wiring with fully documented wiring diagram
- Parity with current ECU performance on dyno
- Framework for how to integrate future modifications/functions
- Streamlined documentation

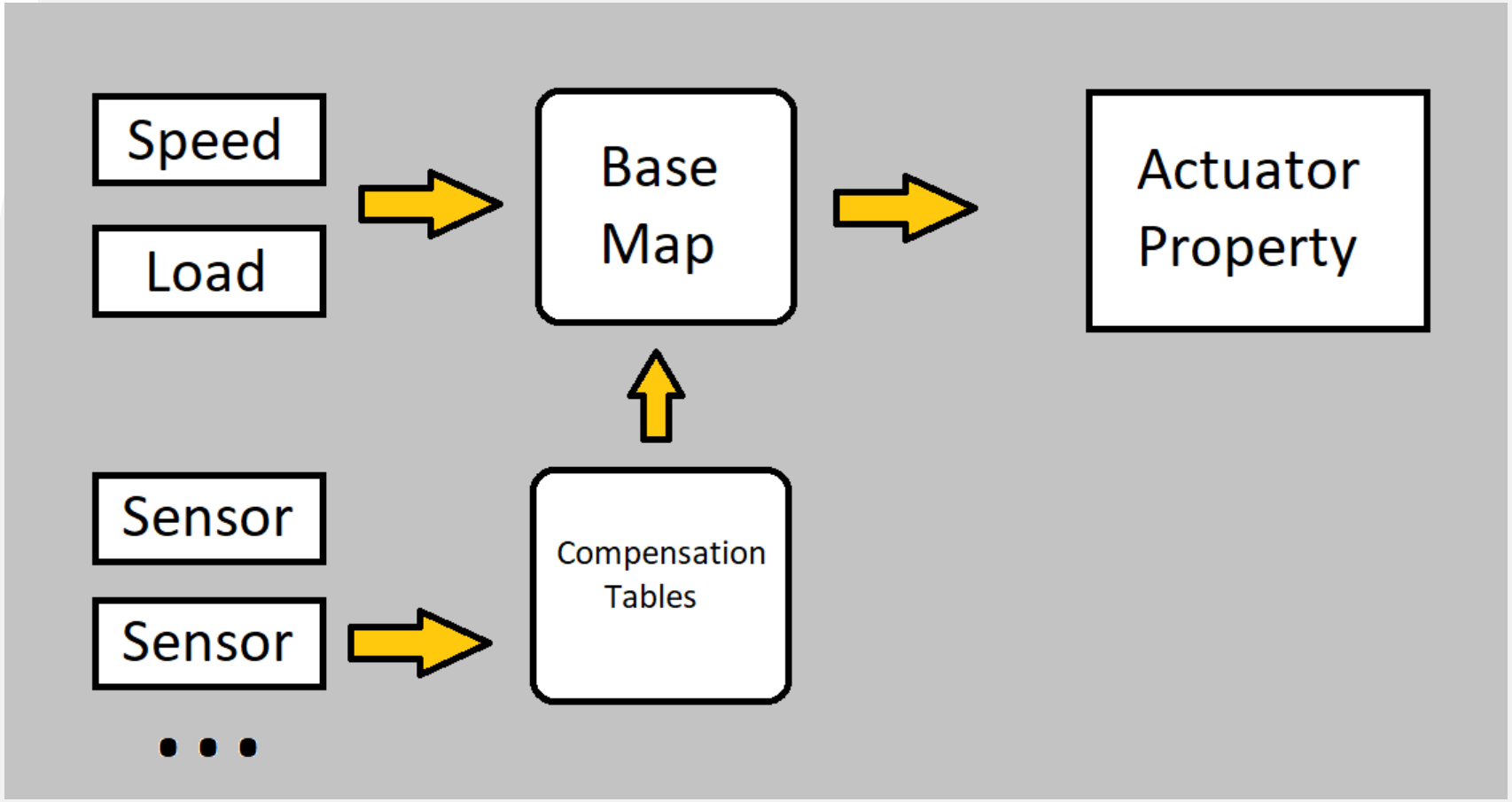
DESIGN

MAIN LEVEL



DESIGN

CALCULATING OUTPUTS



DESIGN

LOOKUP TABLE EXAMPLE

Speed / Load	100	500	1000	2000	3000	4000	5000	6000	7000
0	61	65	70	80	90	100	110	120	130
15	68.5	72.5	77.5	87.5	97.5	107.5	117.5	127.5	137.5
30	76	80	85	95	105	115	125	135	145
45	83.5	87.5	92.5	102.5	112.5	122.5	132.5	142.5	152.5
60	91	95	100	110	120	130	140	150	160
75	98.5	102.5	107.5	117.5	127.5	137.5	147.5	157.5	167.5
90	106	110	115	125	135	145	155	165	175

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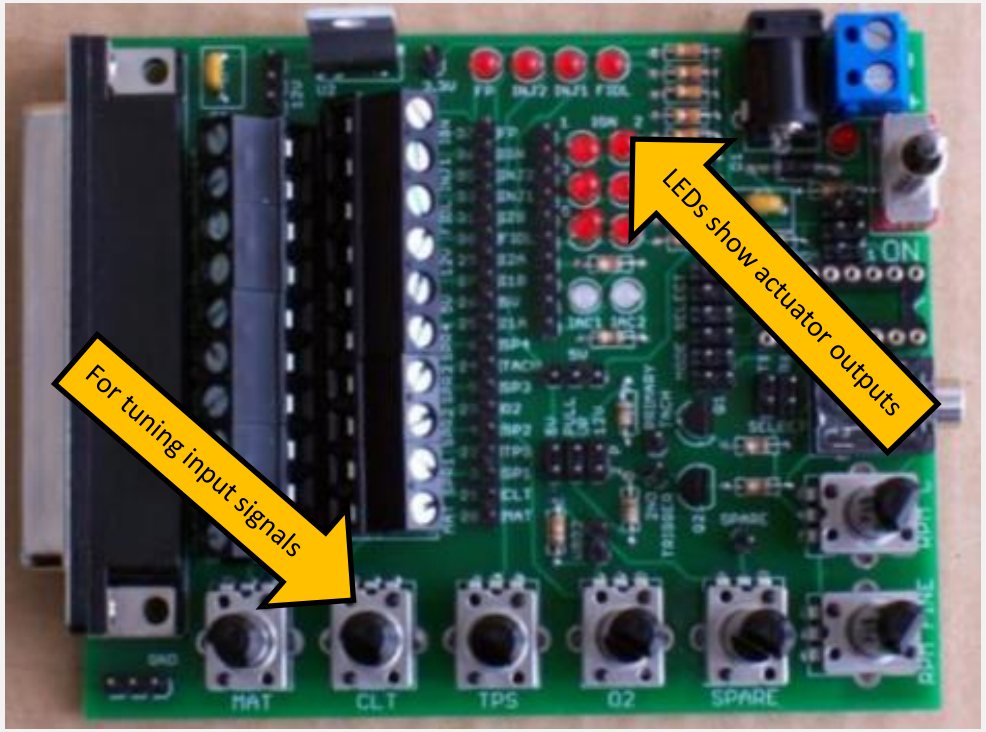
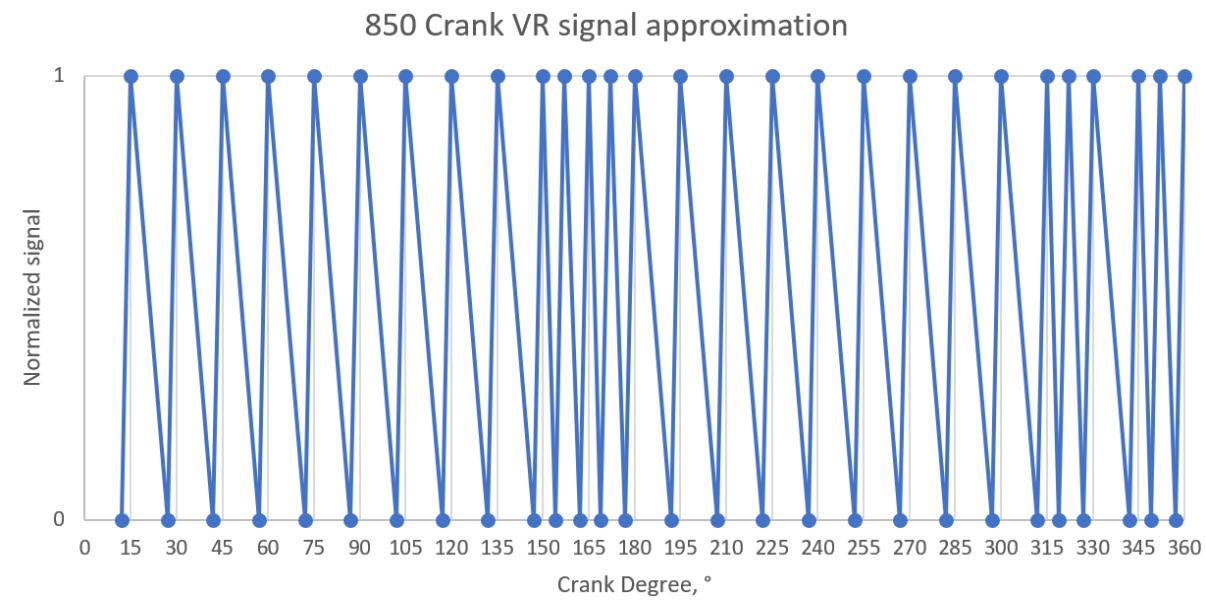
Validation

- Input and output signals are connected and communicating to each other
- Input signal reads as expected
- Output signal reads as expected
- Signal processing properly converts input signal to usable output signal
- Input and output signals properly resolve to crank timing when applicable
- Run signal(s) in virtual engine/JimStim to ensure functionality under realistic conditions

Signal	Deadline
Throttle Position Sensor	7/17/2020
Injection	7/17/2020
Spark (Coil Pack)	7/17/2020
Crank pos	7/17/2020
RAVE act	7/24/2020
RAVE pos	7/24/2020
MAPTS	7/24/2020
Lamda	7/24/2020
Knock	7/31/2020
EGT	7/31/2020
Coolant	7/31/2020
Oil	7/31/2020
Mag in	8/7/2020

JimStim





Simulated crank position signal

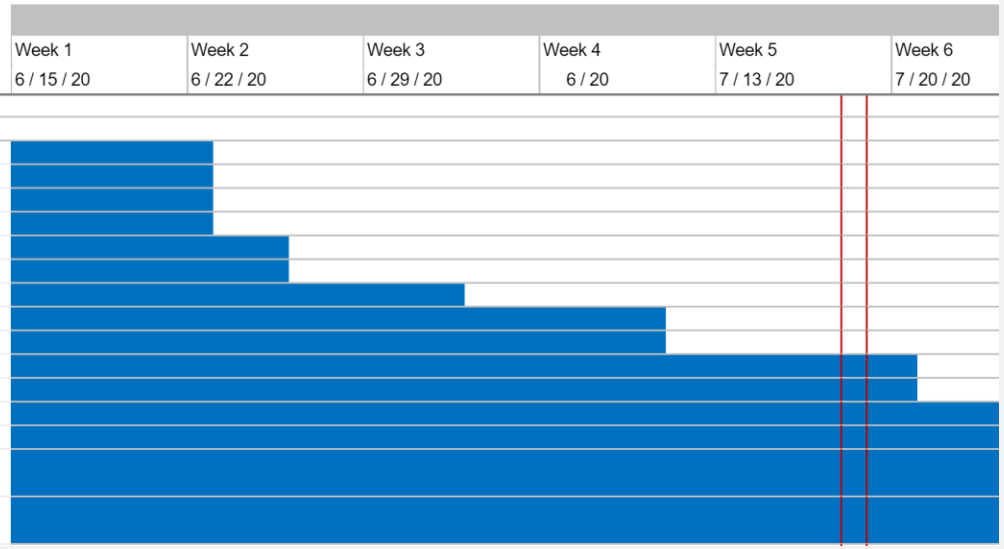
Schedule

- Project timeline
- Task completion tracking
- Integrated schedule and Gantt Chart

University of Idaho Capstone Summer 2020

Project: HYPEIT
Project Start Date: 6/15/2020 (Monday)
Display Week: 1

3.10	*[Insert Rows above this one, then Hide or Delete this row]*			Sat 1/00/00	0%	0
4	**Class Due Dates**	Team				
4.1	Team Contract	All	Mon 6/15/20	Mon 6/22/20	100%	6
4.2	Client Interview Plan	All	Mon 6/15/20	Mon 6/22/20	100%	6
4.3	Initiate Contact with Client	Colin Parke	Mon 6/15/20	Mon 6/22/20	100%	6
4.4	DRAFT Budget Estimates	All	Mon 6/15/20	Mon 6/22/20	100%	6
4.5	Client Visit and Interview	All	Mon 6/15/20	Thu 6/25/20	100%	9
4.6	Product Requirements	All	Mon 6/15/20	Thu 6/25/20	100%	9
4.7	Project Schedule	Hayden Hulse	Mon 6/15/20	Thu 7/02/20	45%	14
4.8	Design Validation Plan	All	Mon 6/15/20	Fri 7/10/20	100%	20
4.9	Portfolio, Wiki, & Logbooks (w/ review form)	All + Individual	Mon 6/15/20	Fri 7/10/20	100%	20
4.10	Design Review	All	Mon 6/15/20	Mon 7/20/20	0%	26
4.11	Value Proposition	All	Mon 6/15/20	Mon 7/20/20	100%	26
4.12	Snapshot Storyboard	All	Mon 6/15/20	Thu 8/06/20	0%	39
4.13	Technical Presentation	All	Mon 6/15/20	Thu 8/06/20	0%	39
4.14	Portfolio, Wiki, Team Member Citizenship, & Logbook (w/ review form)	All + Individual	Mon 6/15/20	Fri 8/07/20	0%	40
4.15	Final Hardware & Software, Design Report, Work Area Checkout, Electronic File Archive	All	Mon 6/15/20	Fri 8/07/20	0%	40



Budget

Capstone Project Budget

Project: HYPEIT

Last Updated 7/16/2020

	2020							Item		
Expense Items	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Total**		
Supplies / Parts / Services:										
M670 ECU	$ 2,000							$ 2,000		
Pi-Innovo Licenses	$ 1,000							$ 1,000		
MatLab Licenses	$ 1,000							$ 1,000		
SXL/GXL Wire	$ 144							$ 144		
Power Supply		$ 50						$ 50		
Dyno Computer			$ 1,000					$ 1,000		
Cloth electrical tape			$ 18					$ 18		
								$ -		
								$ -		**Expenses**
									$ 5,212	**Subtotal**
ME Shop Usage (est. Hrs):								Hours		
								0		
								0		
								0		
								0		
								0		
								0		
							Graduate Student Support (only for SEA projects)	$ -	**including fringe (2.1%)**	
							Shop Overhead (only for SEA projects)	$ -		
							University Overhead (only for SEA projects)	$ 261.90	**5% of all expenses**	
							Totals	**$ 5,212**	**$ 5,500**	$ 288
									Budget	Excess

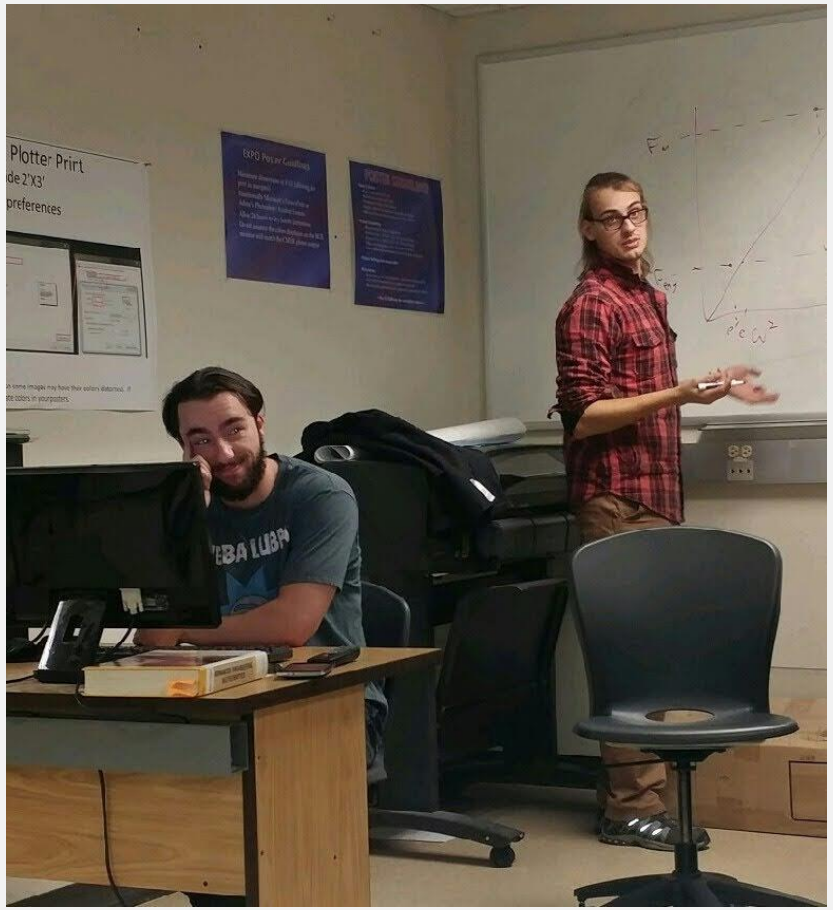
Documentation Plan

- Complete Information Packet from 404
- Relocate all necessary files to team folder

1 Introduction
1.1 Goals
2 Required Software
2.1 MATLAB
2.2 Simulink
2.3 Pi-Innovo
3 Introduction to MATLAB
4 Introduction to Simulink
5 Introduction to IC Engines/ECUs
6 Introduction to JimStim
6.1 JimStim Wheel Pattern
7 Risk Reduction
7.1 Electrical Safety
7.2 Workspace Cleanliness
7.3 Version Control
8 File Management
9 Appendices
9.1 Summer 2020 Capstone Design
9.1.1 Budget
9.1.2 Schedule
9.1.3 Team Contract
9.1.4 Product Requirements
9.1.5 Design Validation
9.1.6 Wiki Page
9.1.7 Literate Program
9.1.8 Meeting Minutes
9.2 Program Outline
9.3 Abreviations

Risk Management

- Diligent documentation and classroom style education
- Kaizen type documents to teach the correct way of doing things
  - Electrical safety
  - File management and version control
- Calibratable and not-calibratable tables
- Hardware and software redundancy checks



QUESTIONS?

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